PARAMAGNETIC CENTERS OF CARBON MATERIALS ON THE BASIS OF VEGETATIVE RAW MATERIALS

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Introduction

Vegetative raw and wastage of agricultural activity is valuable raw for production carbon materials (CM) of various appointment [1, 2]. One of the basic demands which exhibit to such materials, is the stability of their properties supplying optimal structure of products, and also predictability of their behavior in extreme conditions. Consequently, the properties of CM should be stable. However various parties of patterns which obtained at identical technological parameters have various properties (Vs, S_{BET}, SVC etc.). The reason of it is confined in present of some oscillation during CM production in temperature –temporal regime. It was founded, that the structural - chemical conversions which are occurs at low-temperature regime of carbonization result in appearance of stable states in system - paramagnetic centers (PC), which can used as characteristics of property parameters even at small variations of temperature.

Experimental

It was studied the PC nature of CM which carbonized in oxygen atmosphere. The special attention was given to investigation this of process at intermediate stages - when were the water and organic matters eliminating from a parastrophic matrix.
The heat treatment of granulated vegetative raw was carried out on air in range of temperatures 200 - 400^o C. The ESR spectrums were registrated on the modern computer variant of a radiospectrometer PE-1306-M. As a standard we used DFPG, and also ions Mn^{+2} in a matrix MgO. Treating of ESR signal were carried out using standard method.

Results and Discussion

It was established, that at low-temperature carbonization in intermediate single-stage regime we observed the intensive energy of ESR signal range in 300 - 350^o C, and also decrease dip (up to ΔH = 4 Gs) ESR signal width which correlate with character of weight lasses in such temperature interval (fig. 1). The PC characteristics of this CM significally differ from the characteristics of patterns, which had two-stage process of carbonization (ESR signal up to ΔH=1,5-2,0 Gs).

Is was established, that the quality and quantitative variations of ESR signal structure shown sense and collection both physicochemical and phases changes. The investigation of CM have shown, that such materials have abnormal sorption capacity (in particular, on oil) - up to 12 g/g, maximal SVC (3,5 - 4,0 mg-equ/ g) (fig. 2), almost absolutely hydrophoby which keep during long time (of 5-6 months) (fig. 3) [3]. The samples of CM which obtained at conditions differ from optimal, have opposite properties (low sorption capacity, very high moisture capacity, change nature of SVC etc.) [4, 5].
Abnormal of CM in range of a transitional stage - phase transition of second PC characteristics kind was prove by the abnormal physical and biochemical characteristic and also high performance of biodestruction of sorbed oil (fig. 4).

Conclusions

It was shown that the paramagnetic characteristics of carbon which have abnormal nature at a low-temperature regime of carbonization, allow to obtain the information on specificity of energy transformation in CM and consequently, to forecast properties of synthesis materials.

References

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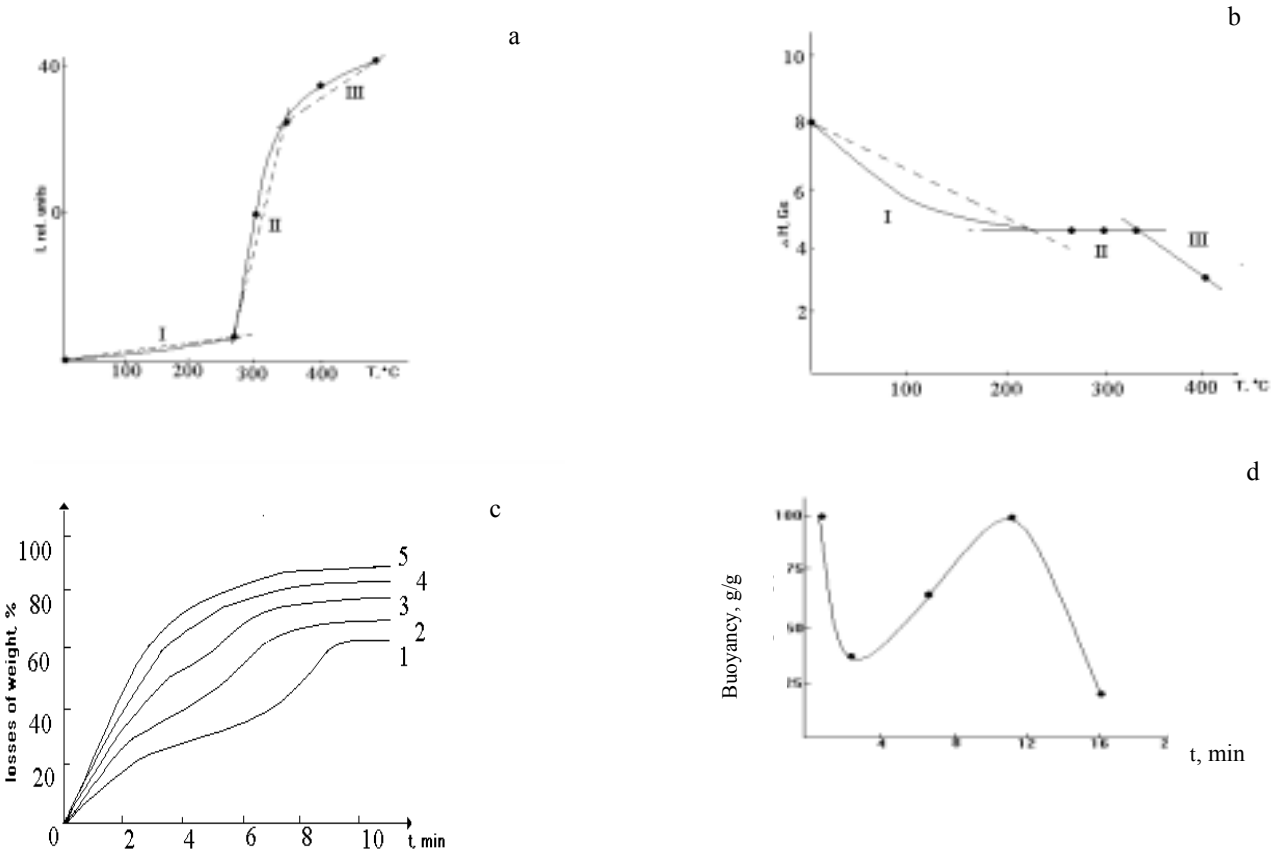

Fig. 1. The change of ESR signal width (a) and concentration of PC (b) depends by carbonization temperature. The losses of weight (c) and buoyancy (d) of CM depends by carbonization conditions.

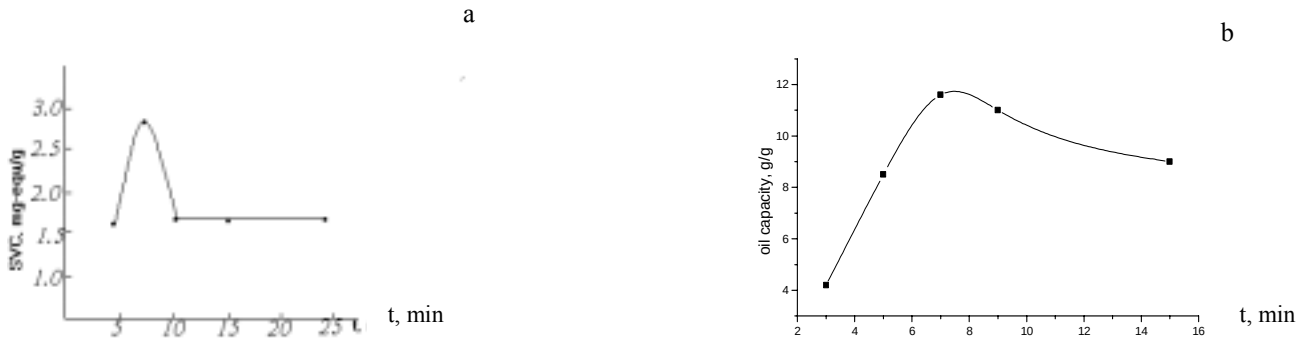

Fig.2 The change of SVC (a) and oil capacity (b) of CM depends by carbonization time

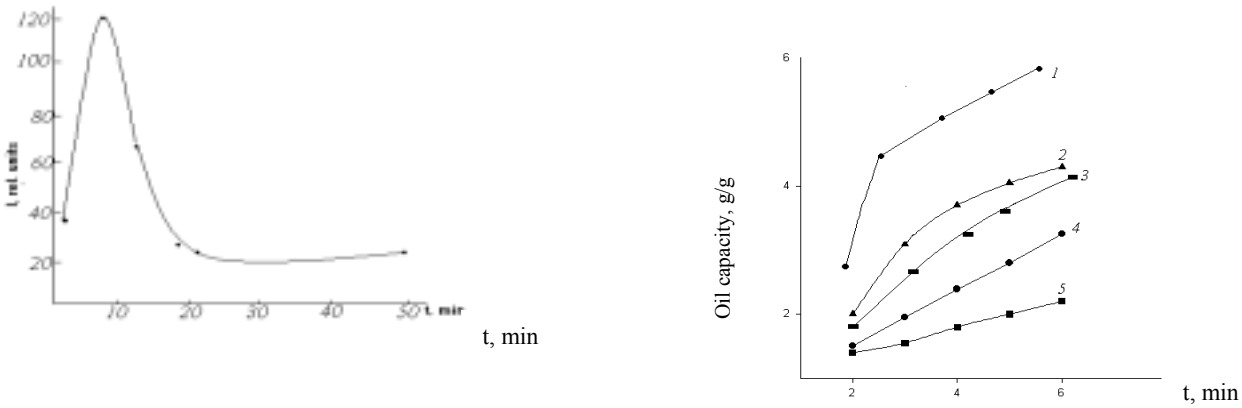

Fig. 3 The change signal intensity of ESR spectroscopy characteristics depends by carbonization time of CM

Fig. 4 The influence of type of vegetable raw of oil sorption from water: 1-active carbon, 2-organosilica, 3-sawdust, 4-carbon (dust), 5-hust rice